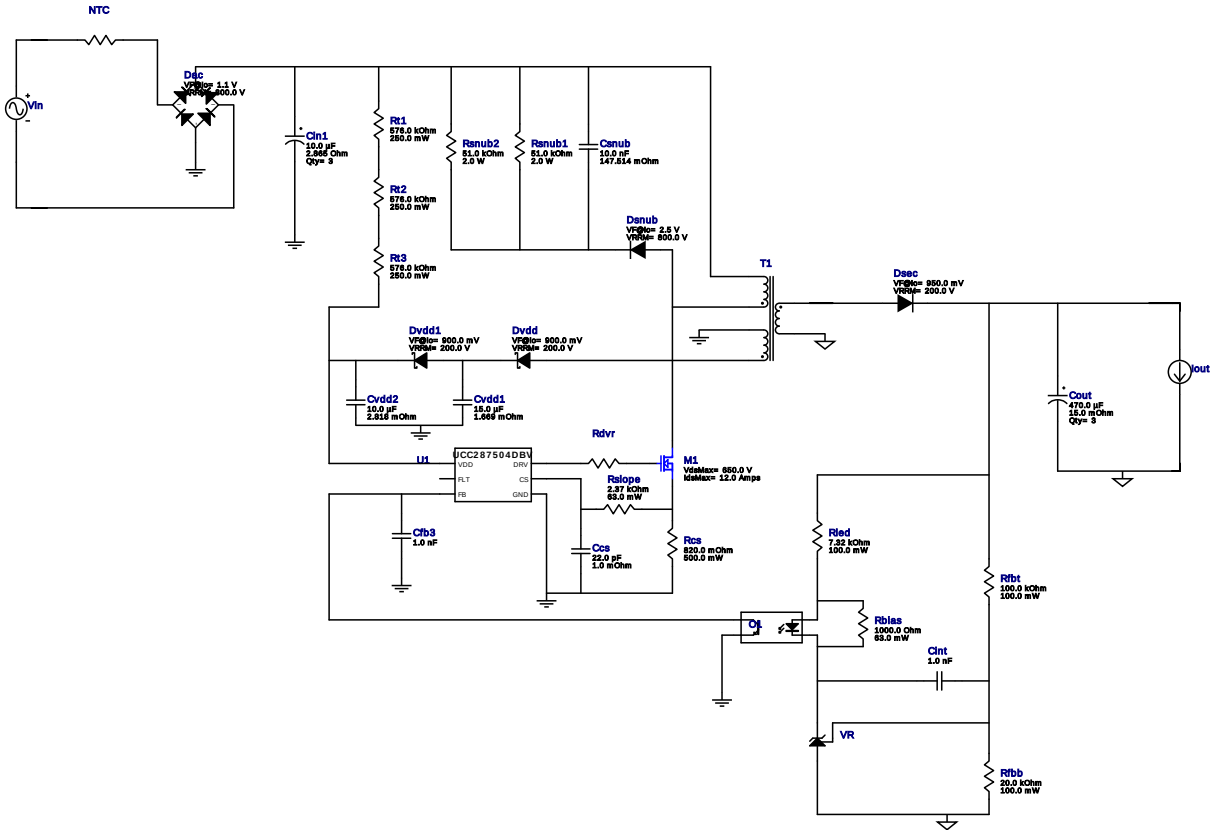
VinMin = 195.0V
VinMax = 265.0V
Vout = 15.0V
Iout = 3.0A

Device = UCC287504DBV
Topology = Flyback
Created = 2026-07-02 09:15:27.260
BOM Cost = NA
BOM Count = 33
Total Pd = 6.42W

WEBENCH® Design Report

Design : 18 UCC287504DBV
UCC287504DBV 195V-265V to 15.00V @ 3A



1. Click on the transformer symbol and select 'Design Transformer' to design using specific transformer cores and bobbin

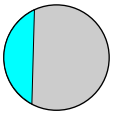
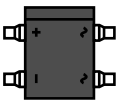
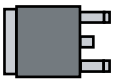
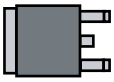
Design Alerts

Component Selection Information

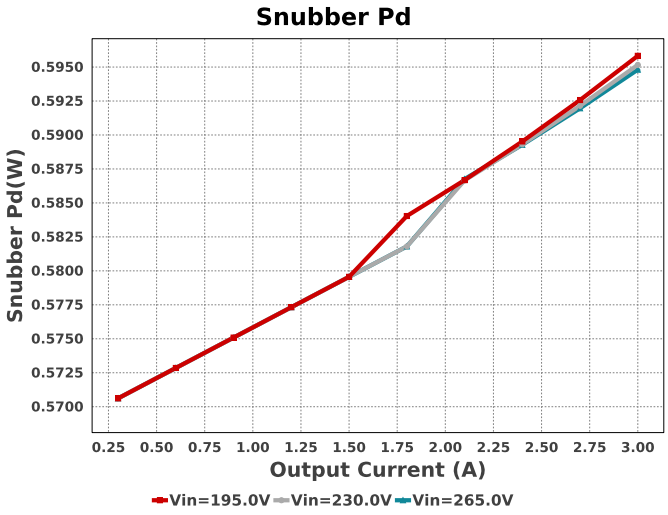
Click on the transformer symbol in the schematic and select "Explore Transformer Core/Bobbin Selection" to design using specific transformer cores and bobbin.

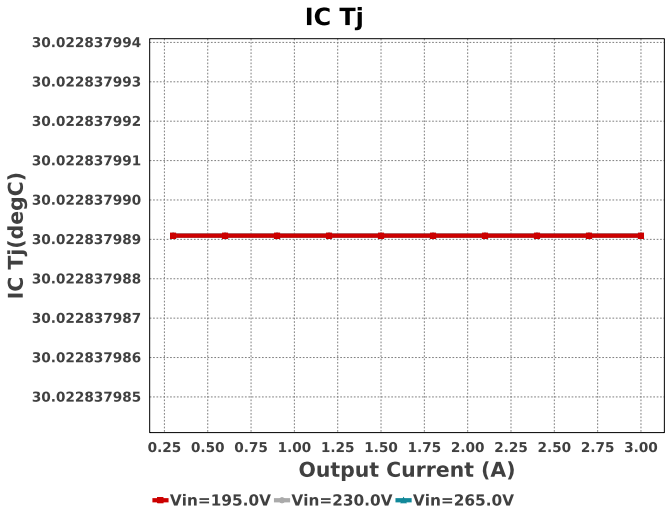
Electrical BOM

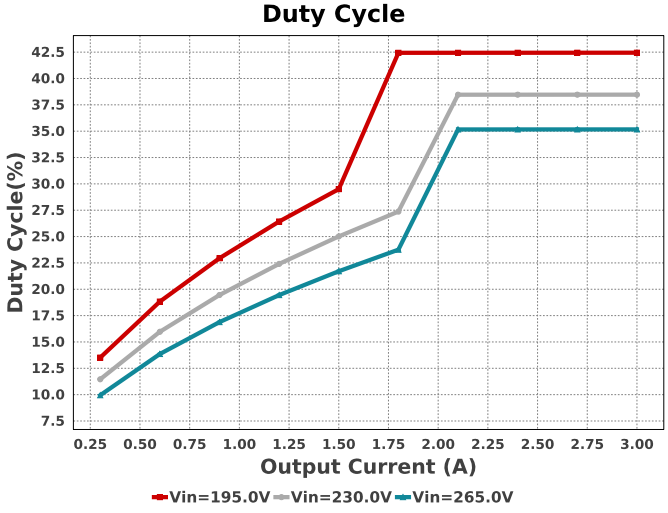
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Ccs	MuRata	GRM1885C2A220JA01D Series= C0G/NP0	Cap= 22.0 pF ESR= 1.0 mOhm VDC= 100.0 V IRMS= 0.0 A	1	$0.02	0603 5 mm^2
Cfb3	MuRata	GRM1885C1H102JA01J Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm^2
Cin1	Panasonic	EEUED2G100 Series= ED	Cap= 10.0 uF ESR= 2.8648 Ohm VDC= 400.0 V IRMS= 300.0 mA	3	$0.31	CAPPR5-10X20 144 mm^2
Cint	MuRata	GRM1885C1H102JA01J Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm^2

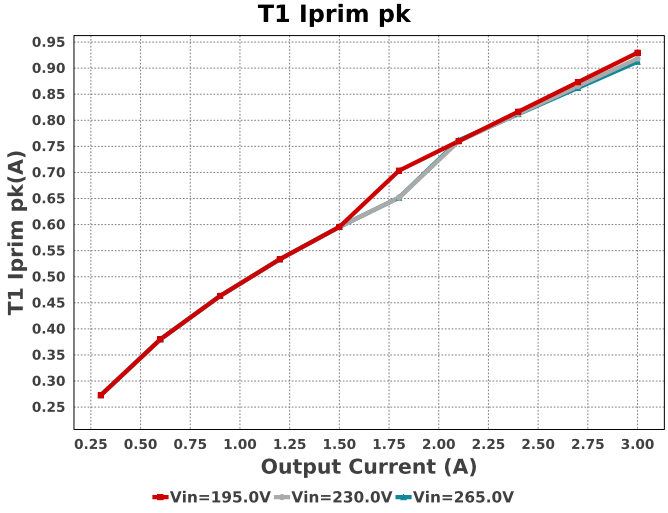
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cout	Kemet	A750MS477M1EAAE015 Series= 3273	Cap= 470.0 uF ESR= 15.0 mOhm VDC= 25.0 V IRMS= 4.9 A	3	$0.36	 A750_MS 144 mm²
Csnub	TDK	C2012X7T2W103K085AA Series= X7T	Cap= 10.0 nF ESR= 147.51 mOhm VDC= 450.0 V IRMS= 0.0 A	1	$0.07	 0805 7 mm²
Cvdd1	TDK	C2012X5R1V156M125AC Series= X5R	Cap= 15.0 uF ESR= 1.669 mOhm VDC= 35.0 V IRMS= 5.0498 A	1	$0.20	 0805 7 mm²
Cvdd2	TDK	C2012X5R1V106K085AC Series= X5R	Cap= 10.0 uF ESR= 2.818 mOhm VDC= 35.0 V IRMS= 3.8868 A	1	$0.12	 0805 7 mm²
Dac	Vishay-Semiconductor	DF08SA	VF@Io= 1.1 V VRRM= 800.0 V	1	$0.28	 DF-S 99 mm²
Dsec	SMC Diode Solutions	SBRD10200TR	VF@Io= 950.0 mV VRRM= 200.0 V	1	$0.18	 DPAK 102 mm²
Dsnub	Bourns	CD1408-FU1800	VF@Io= 2.5 V VRRM= 800.0 V	1	$0.14	 Diode_1408 13 mm²
Dvdd	Fairchild Semiconductor	S320	VF@Io= 900.0 mV VRRM= 200.0 V	1	$0.33	 SMB 44 mm²
Dvdd1	Fairchild Semiconductor	S320	VF@Io= 900.0 mV VRRM= 200.0 V	1	$0.33	 SMB 44 mm²
M1	STMicroelectronics	STD16N65M5	VdsMax= 650.0 V IdsMax= 12.0 Amps	1	$1.91	 DPAK 102 mm²
O1	California Eastern Laboratories	PS2811-1	Optocoupler	1	$1.17	 SSOP-4 111 mm²
Rbias	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
Rcs	Stackpole Electronics Inc	CSR1206FTR820 Series= ?	Res= 820.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.04	 1206 11 mm²
Rfbb	Vishay-Dale	CRCW060320K0FKEA Series= CRCW..e3	Res= 20.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
Rfbt	Vishay-Dale	CRCW0603100KFKEA Series= CRCW..e3	Res= 100.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
Rled	Yageo	RC0603FR-077K32L Series= ?	Res= 7.32 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
Rslope	Vishay-Dale	CRCW04022K37FKED Series= CRCW..e3	Res= 2.37 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
Rsnub1	Vishay-Bccomponents	PR02000205102JR500 Series= ?	Res= 51.0 kOhm Power= 2.0 W Tolerance= 5.0%	1	$0.06	 PR02 117 mm²

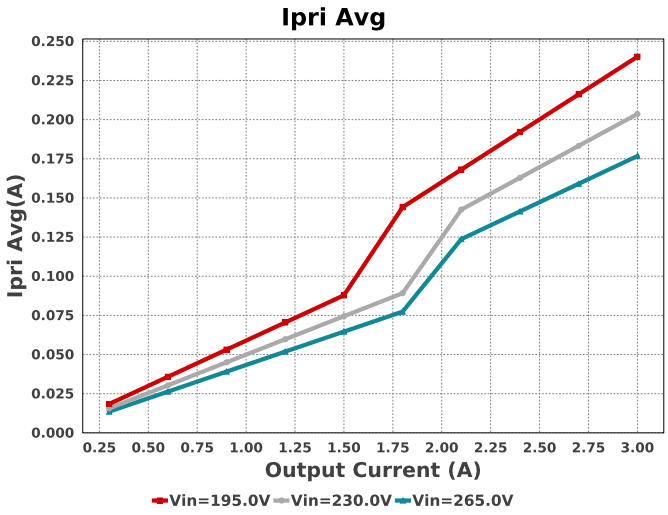
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Rsnub2	Vishay-Bccomponents	PR02000205102JR500 Series= ?	Res= 51.0 kOhm Power= 2.0 W Tolerance= 5.0%	1	$0.06	PR02 117 mm²
Rt1	Yageo	RC1206FR-07576KL Series= ?	Res= 576.0 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	1206 11 mm²
Rt2	Yageo	RC1206FR-07576KL Series= ?	Res= 576.0 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	1206 11 mm²
Rt3	Yageo	RC1206FR-07576KL Series= ?	Res= 576.0 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	1206 11 mm²
T1	Core=Wurth Elektronik , CoilFormer=Wurth Elektronik	Core=150-1680 , CoilFormer=070-5080	Lp= 2.102 mH Turns Ratio(Nas)= 16:12 Turns Ratio(Nps)= 107:12 Npri= 107.0 Naux= 16.0 Nsec= 12.0	1	NA	TDK_B66305 714 mm²
U1	Texas Instruments	UCC287504DBV	Switcher	1	$0.12	R-PDSO-G6 10 mm²
VR	Texas Instruments	TL431IDBVR	Voltage References	1	$0.06	R-PDSO-G3 16 mm²

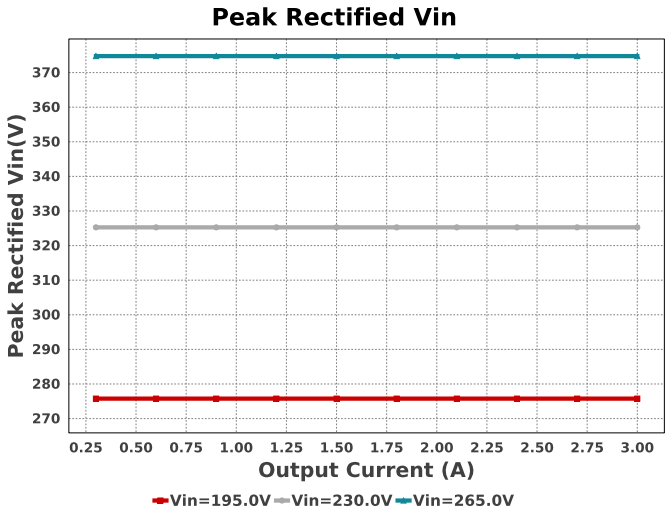


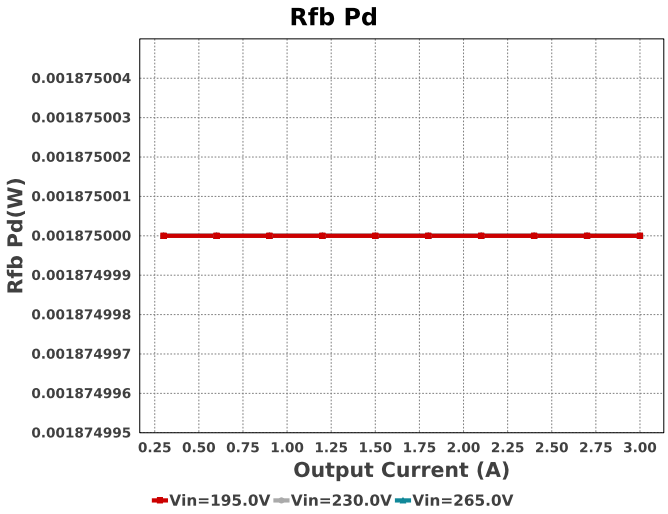


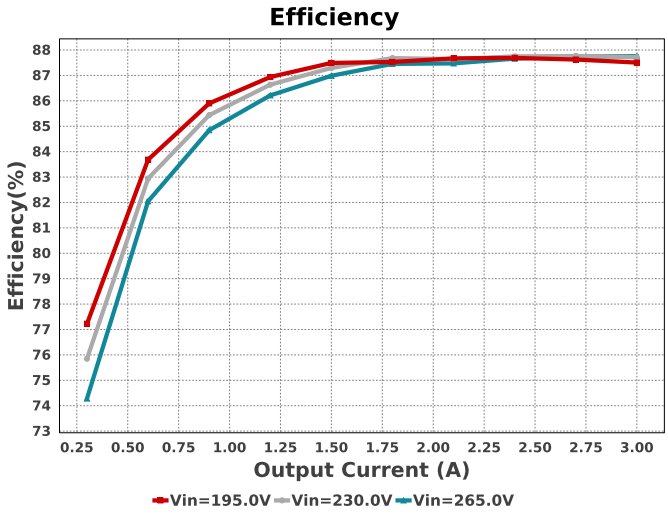


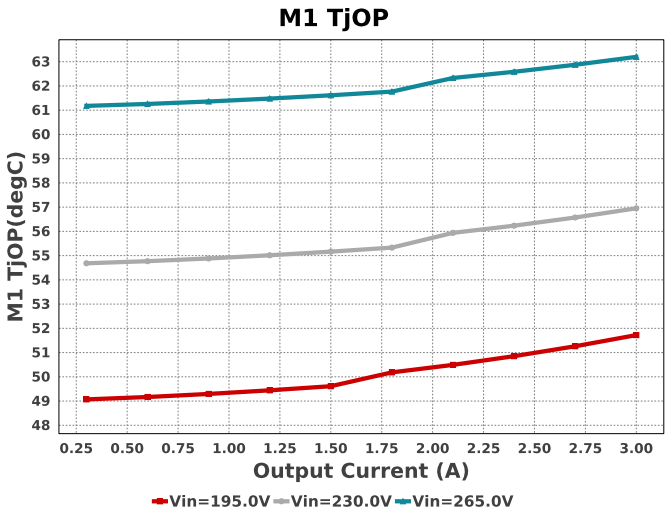


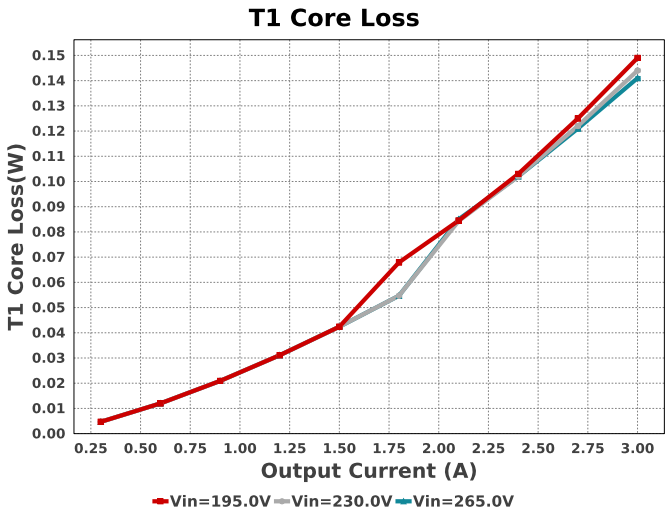


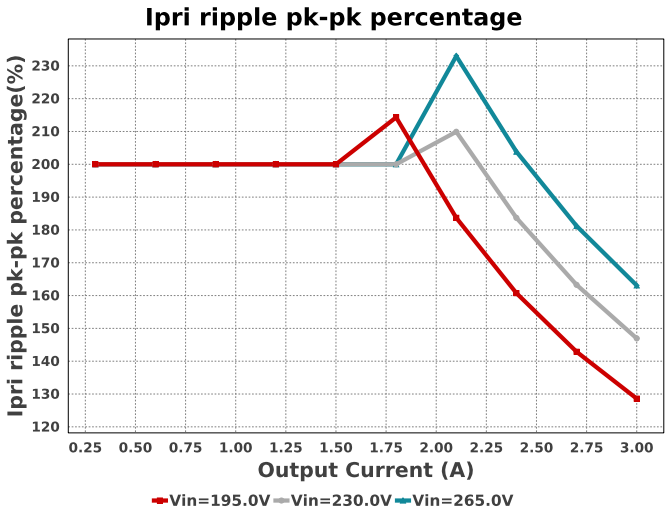


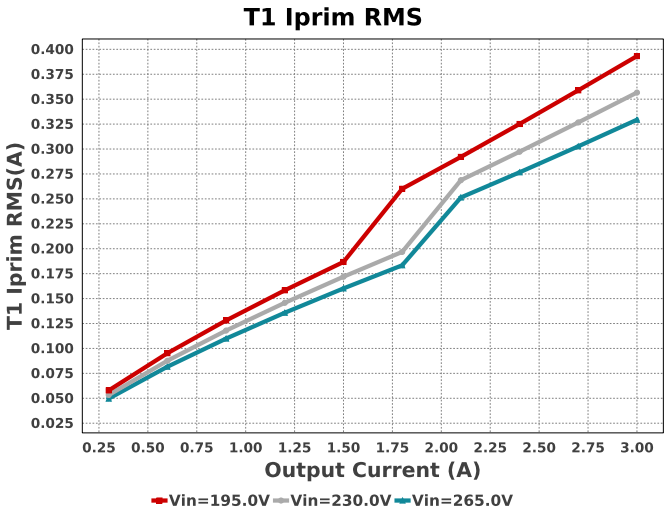


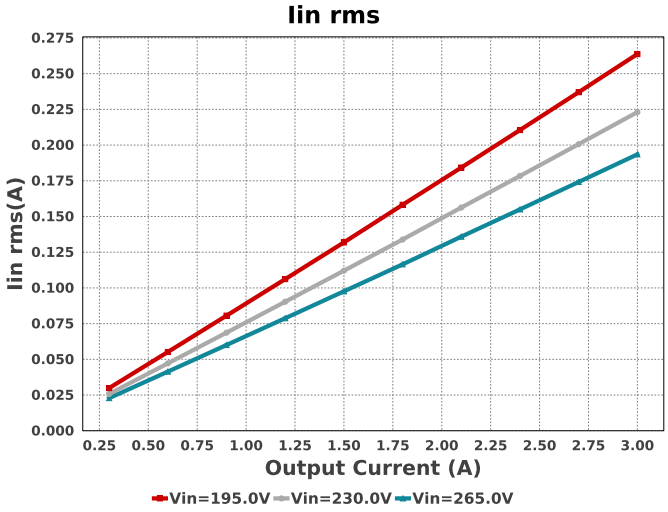


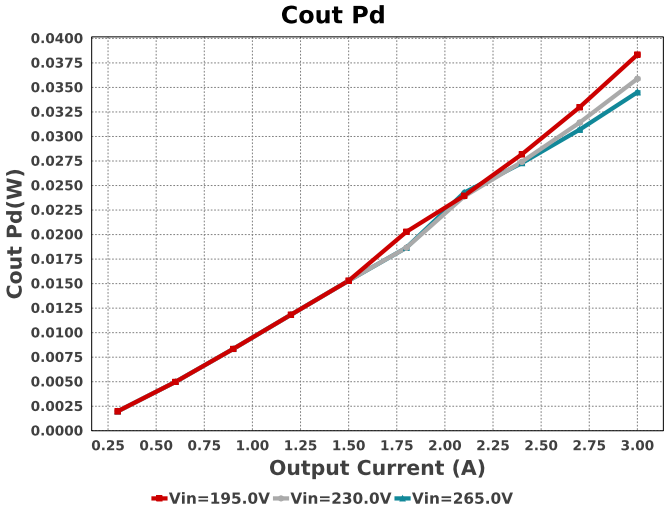


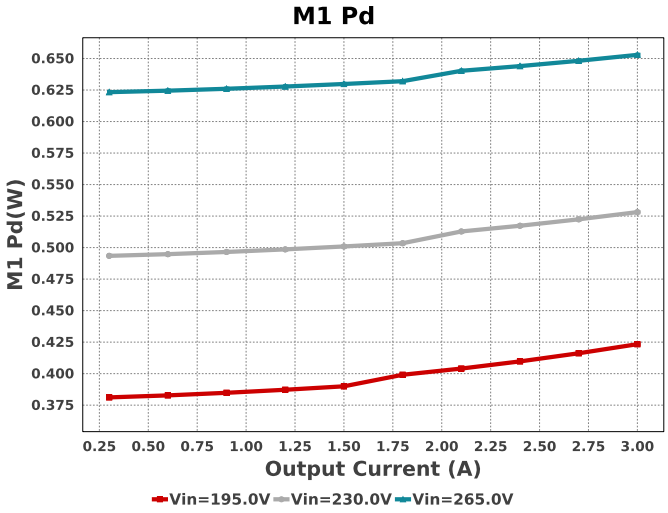


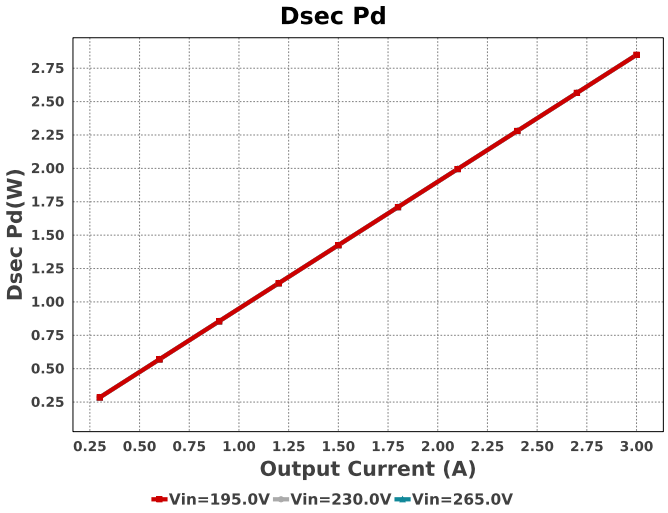


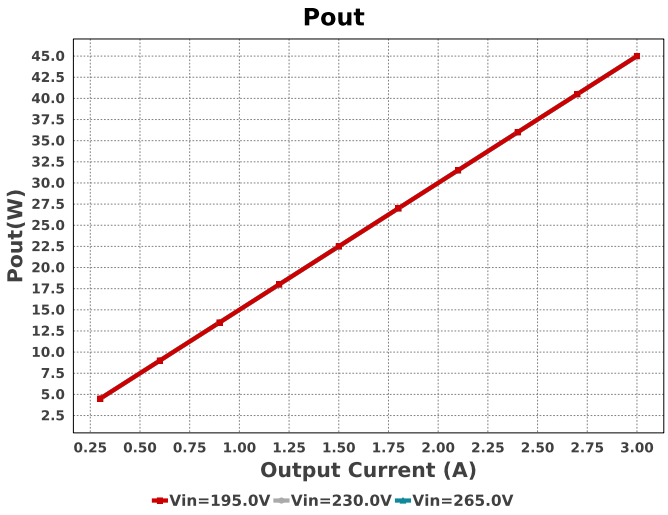


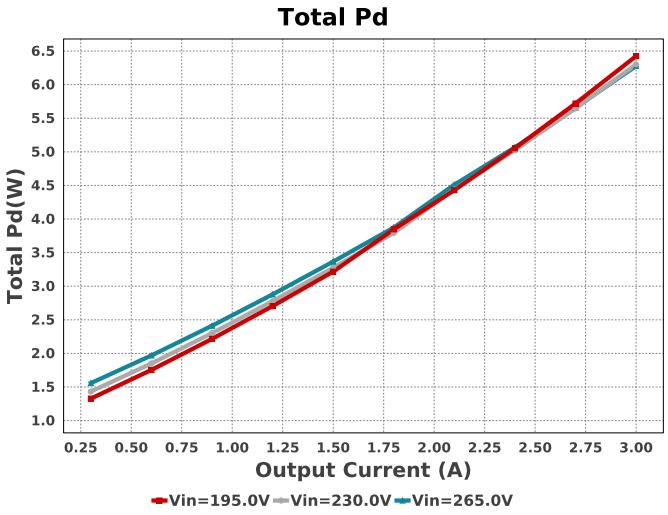


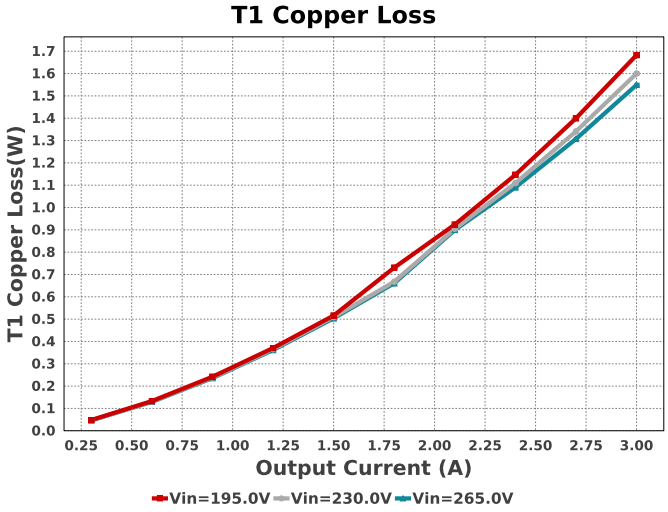


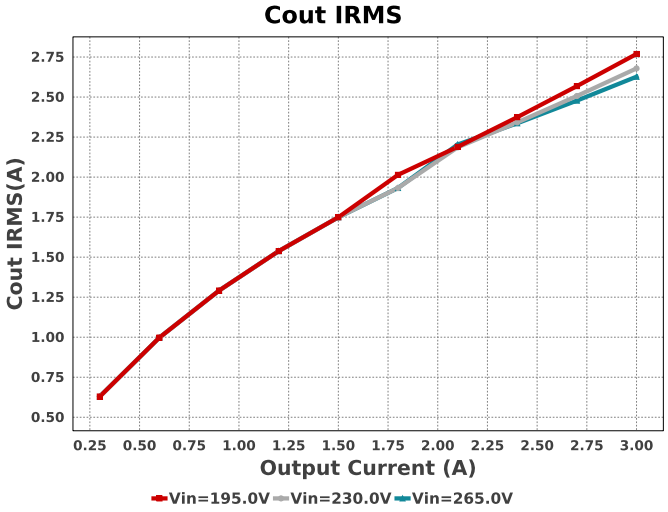


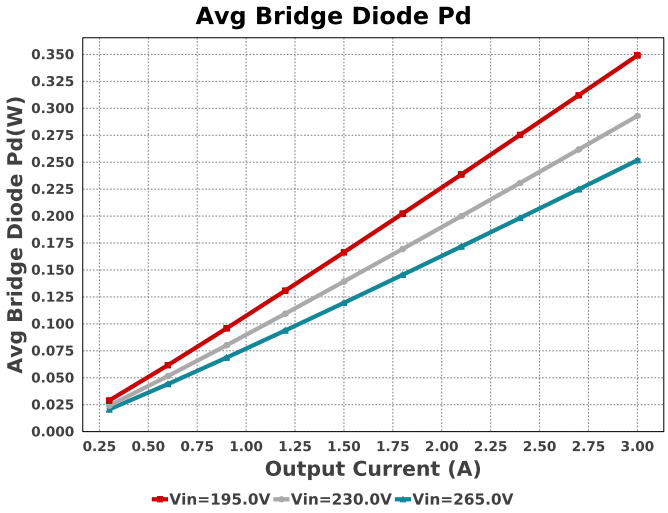


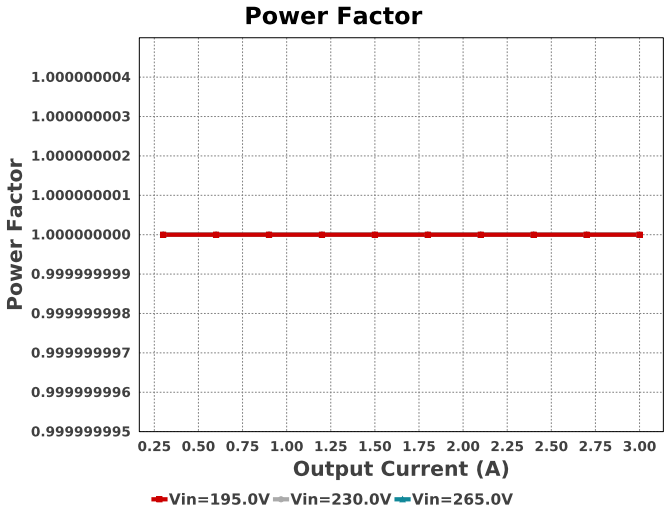


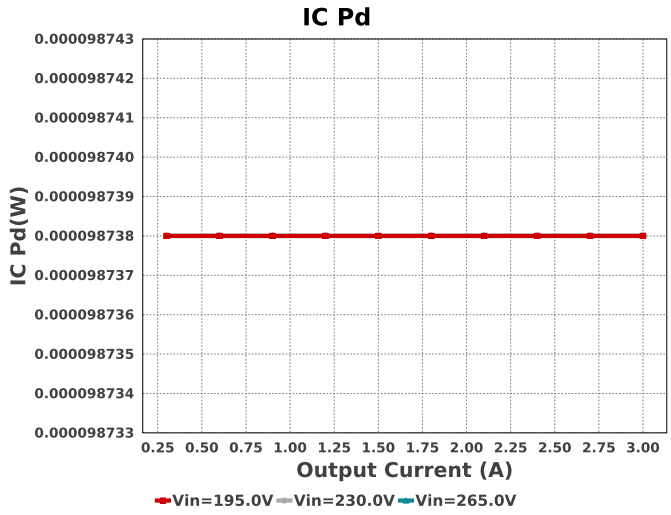


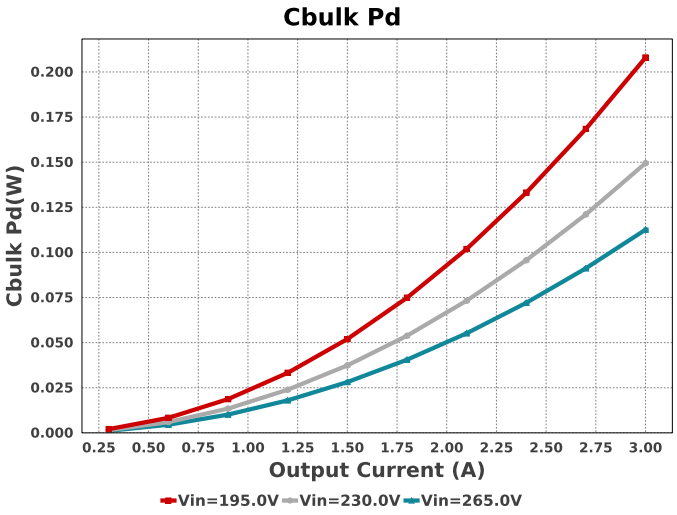


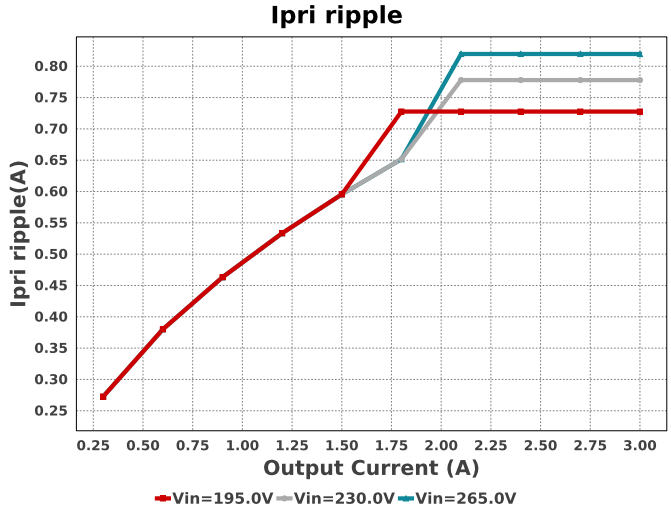


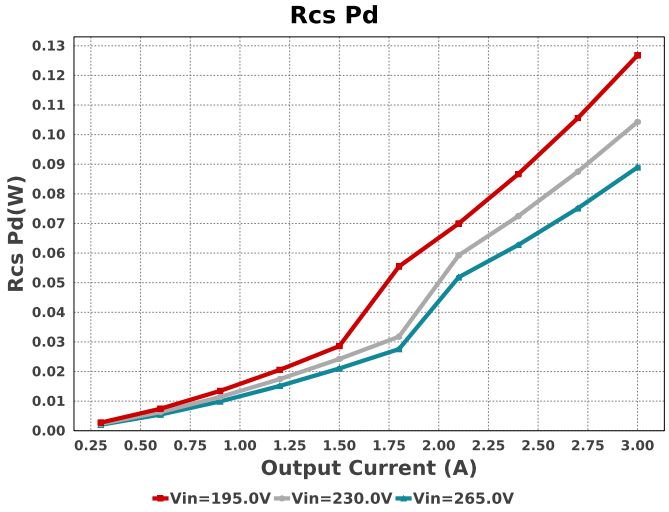


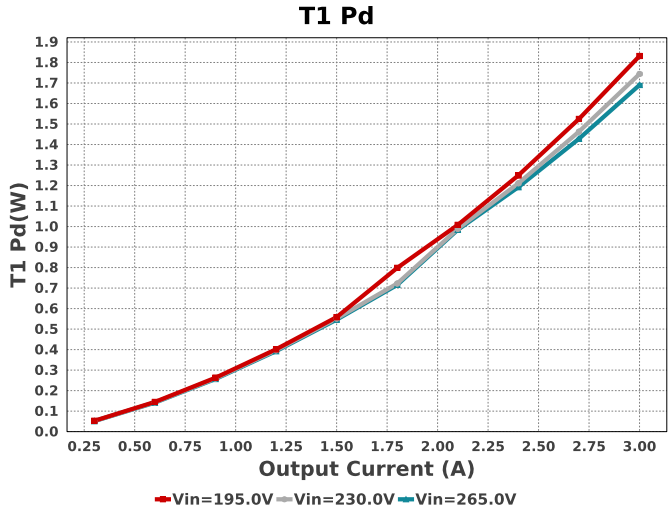












Operating Values

#	Name	Value	Category	Description
1.	BOM Count	33		Total Design BOM count
2.	Total BOM	NA		Total BOM Cost
3.	Cbulk Pd	207.94 mW	Capacitor	Bulk capacitor power dissipation
4.	Cout IRMS	2.769 A	Capacitor	Output capacitor RMS ripple current
5.	Cout Pd	38.338 mW	Capacitor	Output capacitor power dissipation
6.	Avg Bridge Diode Pd	349.07 mW	Diode	Average Power Dissipation in the Bridge Diode over the AC Line Period
7.	Dsec Pd	2.85 W	Diode	Secondary Diode Power Dissipation
8.	IC Pd	98.738 µW	IC	IC power dissipation
9.	IC Tj	30.023 degC	IC	IC junction temperature
10.	ICThetaJA	231.3 degC/W	IC	IC junction-to-ambient thermal resistance
11.	M1 Pd	423.36 mW	Mosfet	M1 MOSFET total power dissipation

#	Name	Value	Category	Description
12.	M1 TjOP	51.721 degC	Mosfet	M1 MOSFET junction temperature
13.	Avg Bridge Diode Pd	349.07 mW	Power	Average Power Dissipation in the Bridge Diode over the AC Line Period
14.	Cbulk Pd	207.94 mW	Power	Bulk capacitor power dissipation
15.	Cout Pd	38.338 mW	Power	Output capacitor power dissipation
16.	Dsec Pd	2.85 W	Power	Secondary Diode Power Dissipation
17.	IC Pd	98.738 µW	Power	IC power dissipation
18.	M1 Pd	423.36 mW	Power	M1 MOSFET total power dissipation
19.	Rcs Pd	126.78 mW	Power	Power Dissipation in Current Sense Resistors
20.	Rfb Pd	1.875 mW	Power	Rfb Power Dissipation
21.	Snubber Pd	595.827 mW	Power	Snubber Power Dissipation
22.	T1 Copper Loss	1.683 W	Power	Transformer Copper Loss Power Dissipation
23.	T1 Core Loss	149.0 mW	Power	Transformer Core Loss Power Dissipation
24.	T1 Pd	1.832 W	Power	Estimated Losses in Transformer
25.	Total Pd	6.425 W	Power	Total Power Dissipation
26.	Rcs Pd	126.78 mW	Resistor	Power Dissipation in Current Sense Resistors
27.	Rfb Pd	1.875 mW	Resistor	Rfb Power Dissipation
28.	Duty Cycle	42.446 %	System Information	Duty cycle
29.	Efficiency	87.506 %	System Information	Steady state efficiency
30.	FootPrint	2.45 k mm^2	System Information	Total Foot Print Area of BOM components
31.	Frequency	65.0 kHz	System Information	Switching frequency
32.	Iin rms	263.72 mA	System Information	RMS Input Current
33.	Iout	3.0 A	System Information	Iout operating point
34.	Mode	CCM	System Information	Conduction Mode
35.	Peak Rectified Vin	275.769 V	System Information	Peak voltage seen at rectified input
36.	Pout	45.0 W	System Information	Total output power
37.	Power Factor	1.0	System Information	Assumed Power Factor for the Application
38.	Vin_RMS	195.0 V	System Information	Vin operating point
39.	Vout	15.0 V	System Information	Operational Output Voltage
40.	Vout Actual	14.625 V	System Information	Achieved Vout with feedback resistor pair
41.	Vout Tolerance	8.0 m%	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
42.	Ipri Avg	240.159 mA	Transformer	Average Current in Primary Winding over the complete Switching Period
43.	Ipri ripple	727.597 mA	Transformer	Ripple Current in the Primary Winding
44.	Ipri ripple pk-pk percentage	128.597 %	Transformer	Primary Current pk-pk ripple percentage(of Ipri avg during ton only)
45.	T1 Copper Loss	1.683 W	Transformer	Transformer Copper Loss Power Dissipation
46.	T1 Core Loss	149.0 mW	Transformer	Transformer Core Loss Power Dissipation
47.	T1 Iprim RMS	393.201 mA	Transformer	Transformer Primary RMS Current
48.	T1 Iprim pk	929.596 mA	Transformer	Transformer Primary Peak Current
49.	T1 Pd	1.832 W	Transformer	Estimated Losses in Transformer

Design Inputs

Name	Value	Description
Iout	3.0	Maximum Output Current
VinMax	265.0	Maximum input voltage
VinMin	195.0	Minimum input voltage
Vout	15.0	Output Voltage
acFrequency	50.0	AC Frequency
base_pn	UCC287504	Base Product Number
source	AC	Input Source Type
Ta	30.0	Ambient temperature

WEBENCH® Assembly

Component Testing

Some published data on components in datasheets such as Capacitor ESR and Inductor DC resistance is based on conservative values that will guarantee that the components always exceed the specification. For design purposes it is usually better to work with typical values. Since this data is not always available it is a good practice to measure the Capacitance and ESR values of Cin and Cout, and the inductance and DC resistance of L1 before assembly of the board. Any large discrepancies in values should be electrically simulated in WEBENCH to check for instabilities and thermally simulated in WebTHERM to make sure critical temperatures are not exceeded.

Soldering Component to Board

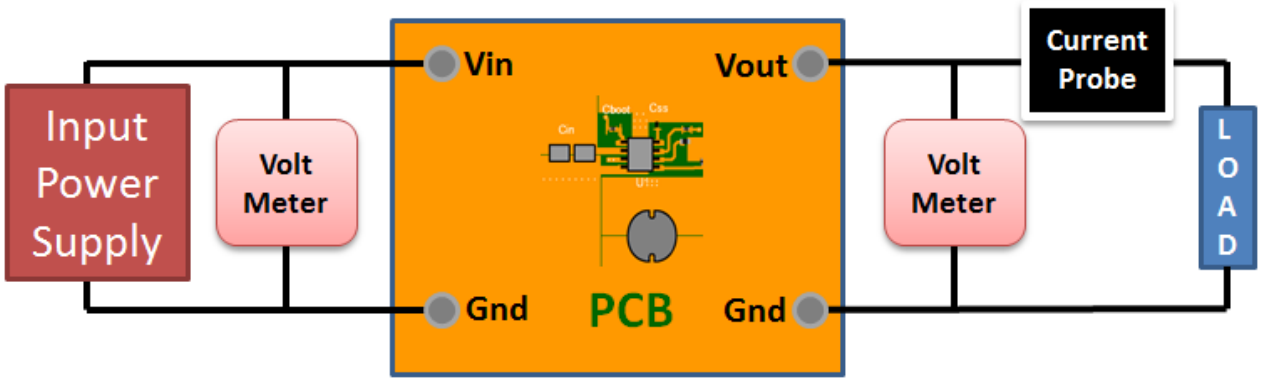
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. To solder the tab town to the board place the iron down on the board while resting against the tab, heating both surfaces simultaneously. Apply light pressure to the top of the plastic case until the solder flows around the part and the part is flush with the PCB. If the solder is not flowing around the board you may need a higher wattage iron (generally 25W to 30W is enough).

Initial Startup of Circuit

It is best to initially power up the board by setting the input supply voltage to the lowest operating input voltage 195.0V and set the input supply's current limit to zero. With the input supply off connect up the input supply to Vin and GND. Connect a digital volt meter and a load if needed to set the minimum Iout of the design from Vout and GND. Turn on the input supply and slowly turn up the current limit on the input supply. If the voltage starts to rise on the input supply continue increasing the input supply current limit while watching the output voltage. If the current increases on the input supply, but the voltage remains near zero, then there may be a short or a component misplaced on the board. Power down the board and visually inspect for solder bridges and recheck the diode and capacitor polarities. Once the power supply circuit is operational then more extensive testing may include full load testing, transient load and line tests to compare with simulation results.

Load Testing

The setup is the same as the initial startup, except that an additional digital voltmeter is connected between Vin and GND, a load is connected between Vout and GND and a current meter is connected in series between Vout and the load. The load must be able to handle at least rated output power + 50% (7.5 watts for this design). Ideally the load is supplied in the form of a variable load test unit. It can also be done in the form of suitably large power resistors. When using an oscilloscope to measure waveforms on the prototype board, the ground leads of the oscilloscope probes should be as short as possible and the area of the loop formed by the ground lead should be kept to a minimum. This will help reduce ground lead inductance and eliminate EMI noise that is not actually present in the circuit.



WEBENCH® Transformer Report

#	Name	Value
1.	Core Part Number	150-1680
2.	Core Manufacturer	Wurth Elektronik
3.	Coil Former Part Number	070-5080
4.	Coil Former Manufacturer	Wurth Elektronik

Transformer Electrical Diagram

Primary

Turns	107.0
AWG	25.0
Layers	4.0
Strands	1.0
Insulation Type	Heavy Insulated Magnet Wire

Secondary

Turns	12.0
AWG	29.0
Layers	1.0
Strands	2.0
Insulation Type	Triple Insulated

Auxiliary

Turns	16.0
AWG	28.0
Layers	1.0
Strands	2.0
Insulation Type	Heavy Insulated Magnet Wire

Transformer Construction Diagram

Winding Instruction

Winding	AWG	Turns	Winding Orientation
Primary First 2/4.0	25.0	54	Clockwise
Auxiliary	28.0	16.0	Counter Clockwise
Triple Insulated Secondary	29.0	12.0	Counter Clockwise
Primary Second 2/4.0	25.0	53	Clockwise

Transformer Parameters

#	Name	Value
1.	Lpri	0.0021H
2.	Inductance Factor(Al)	184.0nH
3.	Npri	107.0
4.	Nsec	12.0
5.	Naux	16.0
6.	Core Type	EE25/13/11
7.	Core Material	TP4A

#	Name	Value
8.	Bmax	0.22T
9.	Switching Frequency	65.00kHz
10.	DMax	0.43
11.	Ipk(Primary)	0.89A
12.	Irms(Primary)	0.37A
13.	Ipk(Secondary)	7.97A
14.	Irms(Secondary)	3.82A

Design Assistance

1. Master key : 32315F27519B724AF2BA809CC55DF58A[v1]
2. **UCC287504** Product Folder : http://www.ti.com/product/UCC28750 : contains the data sheet and other resources.